# SOCIAL AND ECONOMIC EVALUATION OF INNOVATIVE ALLEY COPPICE SYSTEMS MIXING TIMBER TREES WITH BIOENERGY WOOD CROPS IN AGROFORESTRY SYSTEMS

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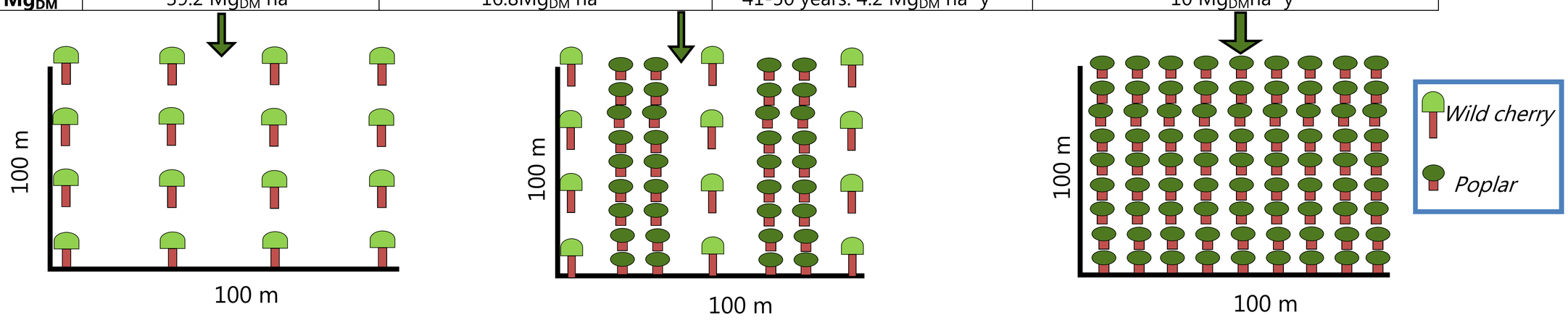
*Alley coppice (AC) is an innovative agroforestry system where high value standard trees are planted in lines with bioenergy short rotation coppice (SRC) as intercrop*

| | PlantationForestry | Alley Coppice | | SRC |
|---|---|---|---|---|
| **Tree species** | *Wild Cherry* | *Wild Cherry* | *Poplar SRC* | *Poplar SRC* |
| **Spacing (m)** | 12 x 12 | 28 x 12 | 2.5 x 0.5 | 2.5 x 0.5 |
| **Number of trees** | 70 (at 60 years) | 30 (at 60 years) | 4800 (planting time) | 8000 (planting time) |
| **Rotation Cycle (year)** | 60 | 60 | 2 years x 20 years x 3 cycles | 2 years x 20 years x 3 cycles |
| **Cover Area %** | 100 | 22 | 78 | 100 |
| **Yield: Timber in $m^3$ Biomass in $Mg_{DM}$** | 98.7 $m^3ha^{-1}$ 39.2 $Mg_{DM}$ $ha^{-1}$ | 42.3 $m^3ha^{-1}$ 16.8$Mg_{DM}$ $ha^{-1}$ | 1-20 years: 6 $Mg_{DM}$ $ha^{-1}y^{-1}$ 21-40 years: 5 $Mg_{DM}$ $ha^{-1}y^{-1}$ 41-50 years: 4.2 $Mg_{DM}$ $ha^{-1}y^{-1}$ | 1-60 years: 10 $Mg_{DM}ha^{-1}y^{-1}$ |




*On-farm Survey*

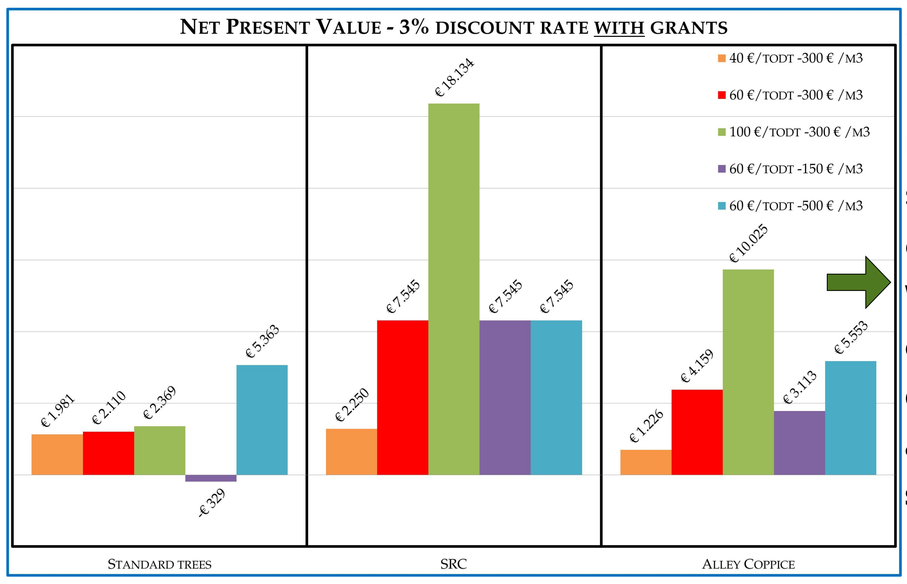
*Economic simulation*

Objective. Assess the farmers' interest in AC system 20 questionnaires were completed and returned. Italian farmers showed to have a great experience on mixed forest plantations: farmers usually manage several tree species combined in different planting schemes. The main constrains were in relation to the market allocation of timber or biomass, while farmers recognise environmental benefits of forestry plantations.

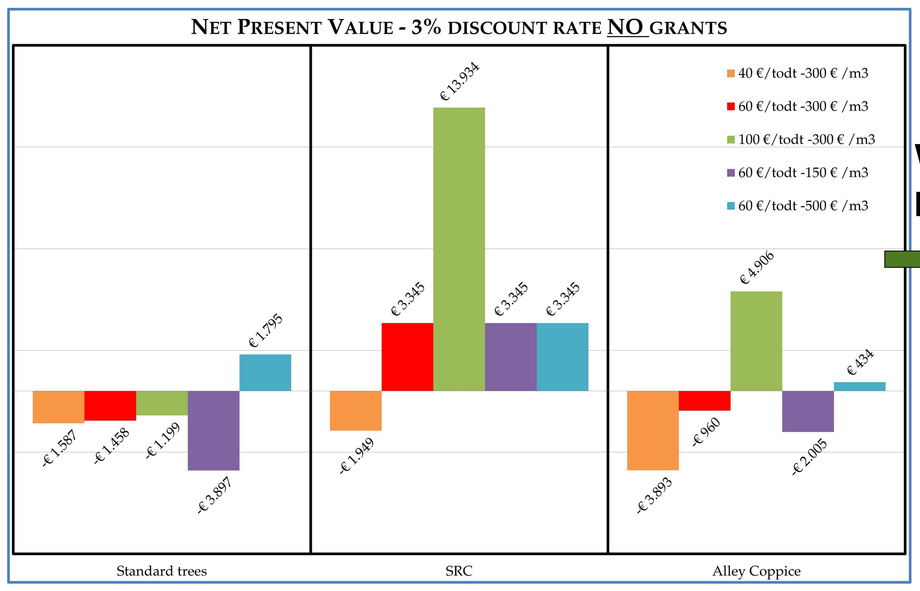
| Expected benefit | Average score (from 1 = low to 5 = high) |
|---|---|
| economic benefits | 4.27 |
| social benefits | 3.37 |
| biodiversity conservation | 4.33 |
| landscape improvement | 4.40 |
| soil quality improvement | 4.22 |

**Farmers' evaluation of the most important expected benefits from AC system**

Objective. Evaluate economic profitability of AC system An economic simulation comparing AC and monocultures was run, with three different scenarios of prices for valuable wood and biomass, with and without grants that cover 100% of plantation costs. Main Conditions: i) All the compared systems are managed without irrigation; ii) Decreasing SRC yield in AC system due to light competition between species;




**With grants covering all costs for tree establishment, SRC is always the most profitable system**.




**Without grants, there is a loss of profit, especially for pure standard trees system**

## *Preliminary Results and Discussion*

⇒ Grant for plantation establishment makes all systems profitable, except when valuable timber price is too low (150 €/$m^3$);

⇒ AC system should guarantee a continuous income from the sale of biomass from intercropped SRC during standard trees growth. Without grants AC is profitable only when biomass price is high (100 €/ $Mg_{dm}$);

⇒ Timber market is highly variable, biomass should ensures a profit even when the timber value would be low;

⇒ Uncertainty of wood market makes the system not so attractive for farmers;

## *Next steps*

⇒ Improve economic simulations including others possible competitions and beneficial interactions (e.g.: improved stem form of standard trees with higher wood quality) between tree species and collecting more data about costs, and prices of wood and biomass.

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**References** Morhart C., Douglas G., Dupraz C., Graves A., Nahm M., Paris P., Sauter U., Sheppard J., Spiecker H. , 2014. Alley coppice – a new system with ancient roots. Annals of Forest Science, article in press. DOI: 10.1007/s13595-014-0373-5